



Western Wind Power Resources Database

Debbie Lew
NREL
Mar 17, 2008



Agenda

- Overview of wind mesoscale modeling project
- Site selection process
- Need your input on sites to include
- Web-based wind resource database hopefully available in the summer
- Contact information to provide input

Wind Mesoscale Modeling

- NREL is undertaking wind mesoscale modeling of much of the US for 2 regional integration studies
- This data will also be helpful for other purposes:
 - Transmission planning
 - Utility resource planning
 - Wind integration studies
 - Assist developers, state energy offices, other planners
- Resulting wind database will consist of:
 - Wind speed dataset: 1 arc-minute (~2km) resolution, 10 minute intervals, 2004-2006, 5 hub heights. No plans yet to publicly release this dataset.
 - Wind power output dataset: 10 minute wind power output for 2004-6 for selected sites based on Vestas V90 3MW turbine at 100m height. Hourly day-ahead power output forecasts. The western US dataset will be publicly available via web-based interface hopefully in summer '08.
- Western US
 - Undertaken to develop time-series wind speed data for Western Wind and Solar Integration Study (WWSIS) and also Northwest Wind Integration Forum
 - Funded by NREL (and BPA for the Northwest)
 - 3TIER Group modeling wind speed and wind plant power output
- Eastern US
 - Eastern Wind Integration and Transmission Study
 - Funded by NREL
 - AWS/Truewind undertaking modeling

This is modeled (not measured) wind data

Western US:

- 3TIER generates historical wind data by running a Numerical Weather Prediction Model using physical conservation equations that ‘recreate the weather’ for 2004-6.
- They sampled the weather at a 1 arc-minute (~2km) spatial and 10 minute temporal resolution, and at 5 hub heights (10, 20, 50, 100, 200m).
- Based on a limited number of actual tower measurements for that time period, they did a sophisticated adjustment of (MOS-corrected) the model so that the data more accurately reflects actual wind speed measurements.
- Validation reports comparing the model wind speed results to actual data will be produced by 3TIER when their modeling is complete.
- 3TIER used SCORE-lite to convert wind speed to power output, assuming a Vestas V90 3 MW turbine at 100m hub height. Each grid point can hold 10 turbines or a 30 MW wind plant. The SCORE-lite process applies a probability distribution function to the manufacturer’s power curve to replicate actual wind farm output.
- 3TIER produced hourly forecasts for day-ahead wind power output for the 30,000 selected sites.

This database was designed for:

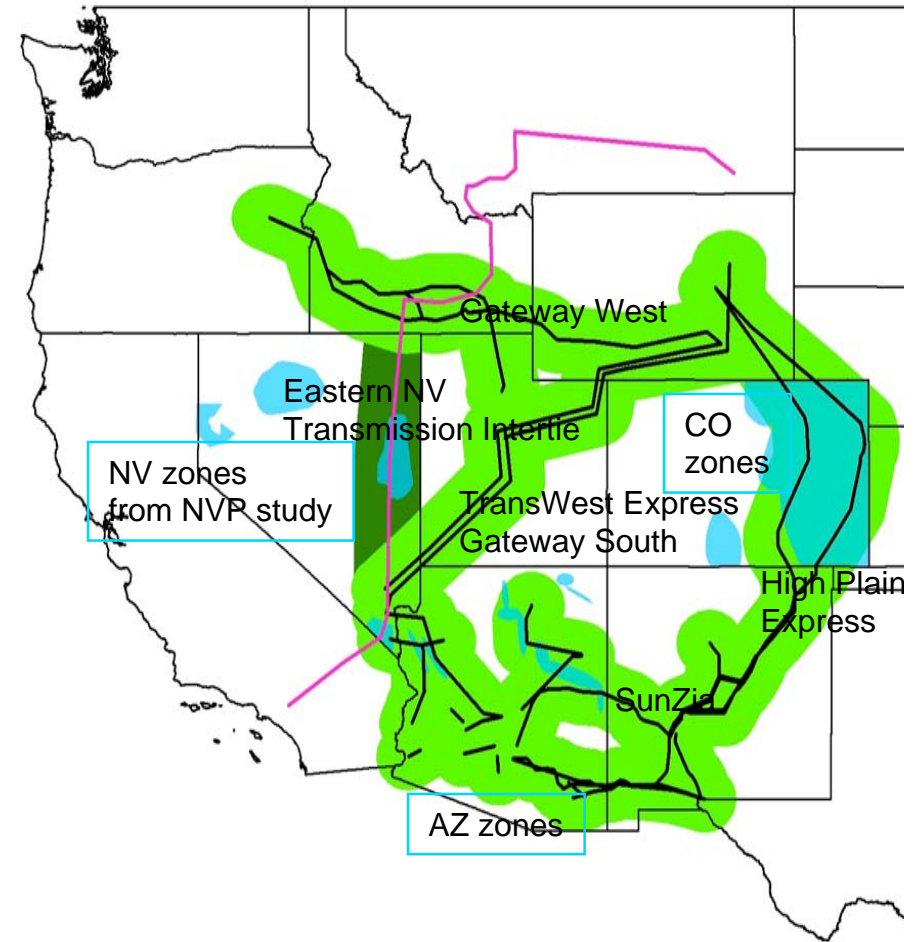
- Spatial and temporal comparisons of sites
 - Geographic diversity
 - Load correlation
- Estimates of power production from hypothetical wind plants
 - Investigating needs for storage based on wind variability
 - Examining potential transmission line loadings from hypothetical wind farms
 - Simple economic calculations comparing cost of delivered energy from in-state versus out-of-state

This database was not designed for:

- Needs for high accuracy, absolute wind speed or power output
- Long-term average wind speed or wind power output
- This was not designed to be used as the only basis for investment. Ground-truthing modeled data with actual measurements is critical.

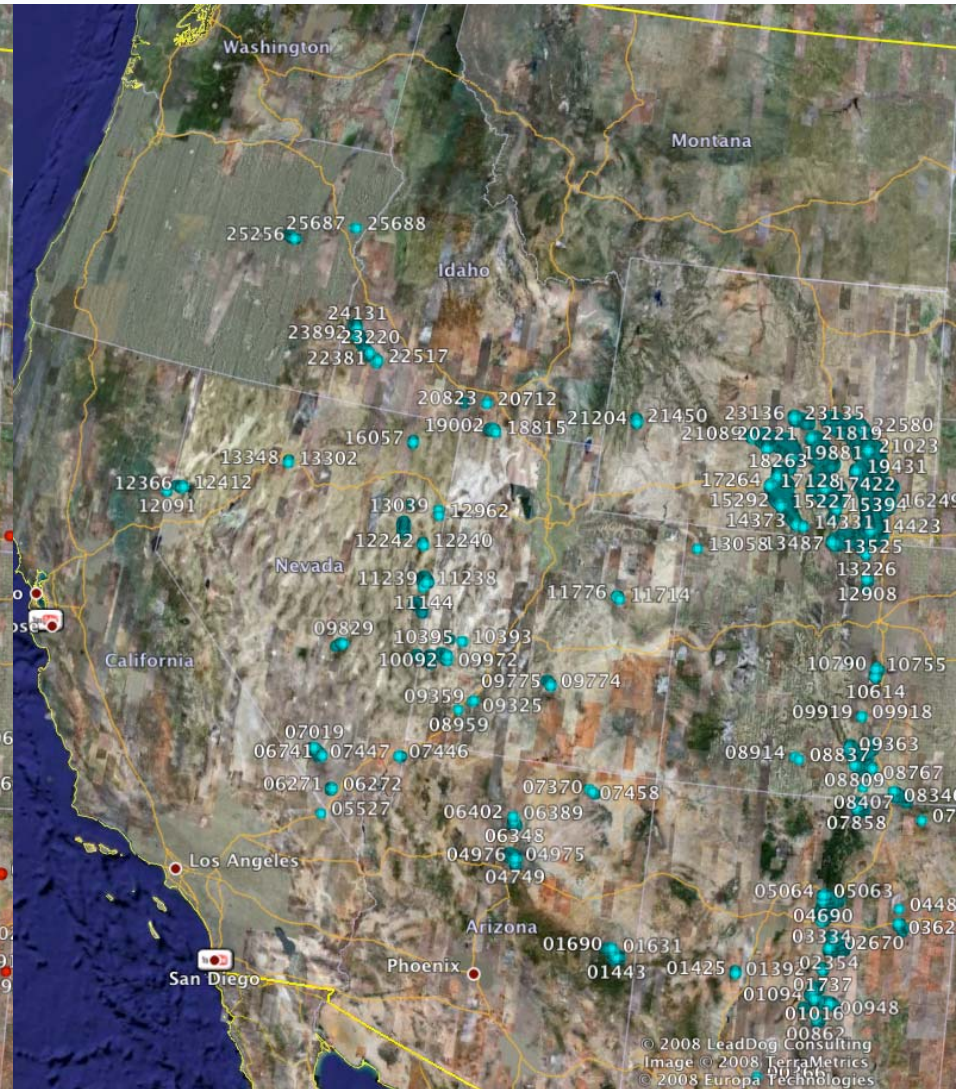
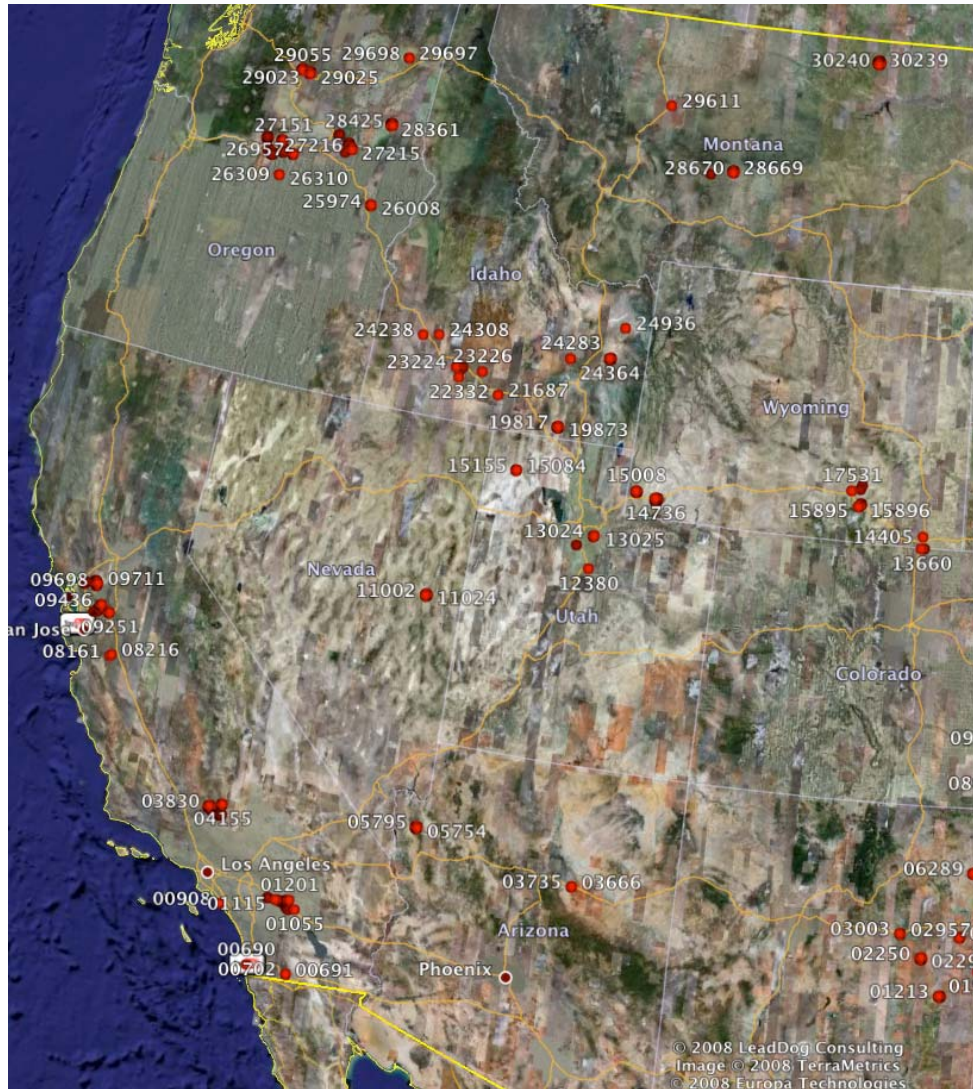
Site selection

- 3TIER downselected from 1.2M to 30,000 points so that we could work with something reasonable in the WWSIS.
 - Exclusions - recreation, urban, forests, slopes, high elevation, etc. (NREL)
 - Preselected sites - existing or planned wind plants (Platts database/NREL)
 - Transmission corridors or zones (200 GW) - based on proposed new transmission and initial zone information (excl new NV zones)
 - Load correlation (250 GW) - best diurnal correlation with Westconnect load
 - Best resource (450 GW) - best wind power density



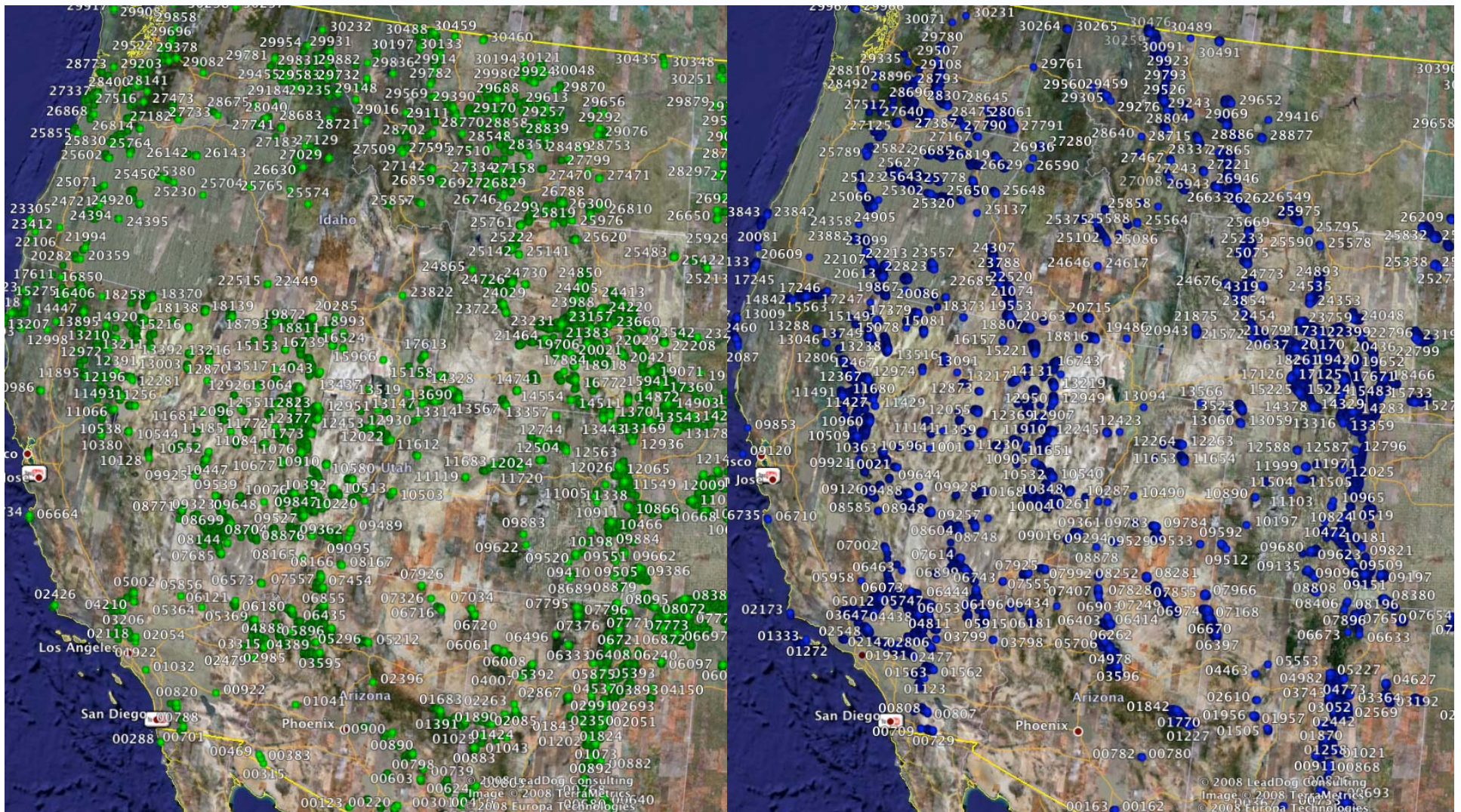
Preselected

Transmission corridor/zone



Load correlated

Best resource



Your input is requested

- Are there sites that you think are likely to be developed in the next two decades that we should model?
 - We need this information in latitude and longitude coordinates
- For the WWSIS study, GE is developing scenarios of large penetrations of wind and solar to model. What areas do you think should be included in a 30% wind penetration scenario and what areas should be excluded?
 - Circles drawn on the pdf maps are fine for this input. Please explain why you think these areas should be included or excluded.

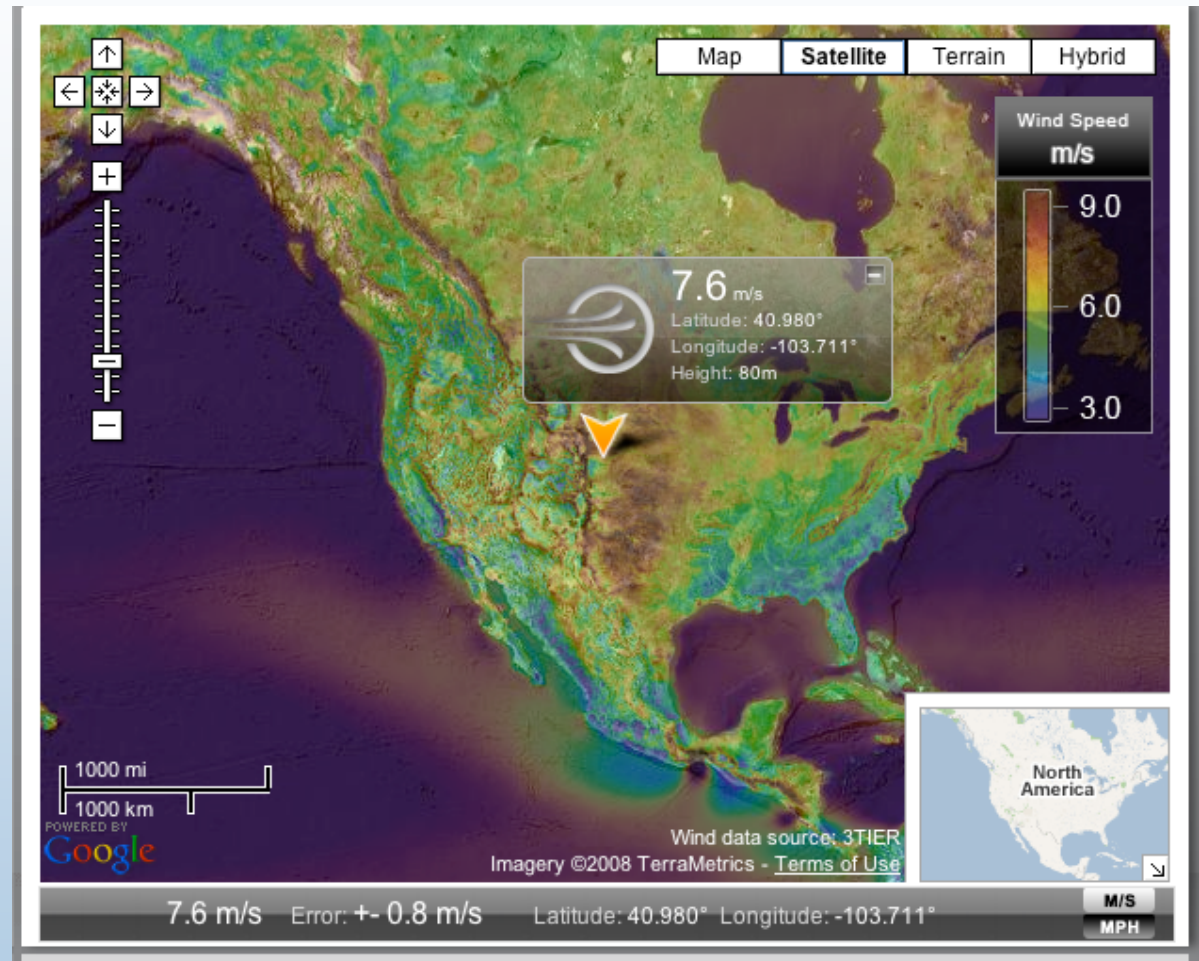
We need input by March 21 to keep our WWSIS study on track.

How to view sites that have been selected

- To zoom in on specific areas in geographic detail, view sites based on how they were selected, and view wind characteristics of sites
 - Google Earth
 - <http://wind.nrel.gov/public/WWIS/3tdesc.kmz>
 - Clicking on a point allows you to view wind speed, power, elevation, and capacity factor for 30 MW Vestas V90 wind plant on this site
- To view wind power density maps at 100m hub height, zoom in on sites with limited detail, and view existing and planned wind plants separately from algorithm-selected sites
 - Adobe Reader (.pdf)
 - <http://wind.nrel.gov/public/WWIS/maps/>
 - Layers can be used to view wind power density information separately from sites

Web-based interface

- Similar to 3TIER's FirstLook ->
- Click on site and download 10 minute wind speed and wind power output data stream for selected periods
- Planned release in summer to be accompanied by webinars explaining use of database



Contact information

- To provide input on additional sites to be included (deadline 3/21/08)
 - Erik Ela, NREL, 303-384-7089
 - FAX 303-384-7060
 - erik_ela@nrel.gov
- Contact for more information about the studies
 - Debbie Lew, NREL, 303-384-7037
 - debra_lew@nrel.gov